

TECHNICAL MEMORANDUM

DATE: November 17, 2022
TO: Ally Holmqvist, Metro
FROM: Ryan Farncomb, Kirsten Pennington (KLP Consulting), Oren Eshel (Nelson\Nygaard)
SUBJECT: Approach to assessing HCT corridor readiness, modes, and tiering
CC: Metro High Capacity Transit (HCT) Strategy Update

This memorandum documents the proposed approach to determining high capacity transit (HCT) corridor “readiness,” corridor ranking, and discussion of factors that will influence future mode choice in each corridor. Metro will use this assessment to shape the HCT Strategy update, including identifying which corridors are priorities for implementation. The approach in this memo builds on the evaluations conducted previously for the 2009 and 2018 iterations of the HCT Strategy.

CORRIDOR READINESS EVALUATION

The prior *Revised Corridor Evaluation Memorandum* describes the overall approach to identifying the preliminary vision of possible HCT corridors and evaluating them through a two-step process. Corridors that emerge from this “Level 1” screening, including previously identified corridors from 2009 and 2018 HCT system planning work that have not yet advanced, will be evaluated with this Level 2 screening. The Level 1 evaluation identified the preliminary HCT vision corridors that are subject to further screening and evaluation. Corridors with existing regional commitments – such as Southwest Corridor LRT, 82nd Avenue, and the Interstate Bridge Project, will not be evaluated further and are assumed to be included in the final vision as “Tier 1” corridors (see Corridor Ranking section below).

This memo describes the Level 2 screening which focuses on corridor “readiness;” meaning, whether the right conditions are in place to support advancing a given corridor for HCT investment. The Level 2 criteria are shown in Table 1. Attachment A shows an example evaluation using these criteria. These criteria are refined based on the 2018 evaluation and include criteria related to climate and equity, among other RTP policy priorities, and federal funding. The project team added these criteria to reflect regional policy priorities.

The federal funding criteria are based on the Federal Transit Administration’s (FTA) Capital Investment Grants (CIG) program. This program is the most substantial non-local source for HCT funding in the Portland-Vancouver region and has funded many HCT investments, including much of the existing LRT system. Because of the outsize influence this program has on funding viability, the Level 2 screening criteria were revised to reflect the CIG program’s criteria, thereby helping to ensure readiness of project corridors.

Table 1. Level 2 Corridor Evaluation Criteria

Criteria	Measure	Data Source/Notes	Methodology
Transit Travel Time Benefit	Ratio of personal vehicle travel time to transit travel time	HCT Plan (2018) Core Criteria Meets Section 5309 Capital Investments Grants (CIG) Small Starts Program “Mobility Improvements”	The team will compare the average travel time at 3:00 PM on a typical weekday for personal vehicles versus transit; the higher this ratio, the greater the opportunity to improve transit travel times.

Criteria	Measure	Data Source/Notes	Methodology
		Travel model data	
Productivity + Cost Effectiveness	Existing boardings per revenue hour in a given corridor Capital Cost per Rider (range to account for modal options)	HCT Plan (2018) Core Criteria Input to 5309 Capital Investments Grants (CIG) Program "Cost Effectiveness" measure	Boardings per revenue hour will be calculated based on 2019 and modeled 2040 boardings and transit revenue hours. Capital cost per rider will be presented as a range, based on average per-mile costs for two HCT modes (LRT and BRT).
Environmental Benefit	Change in GHG emissions associated with HCT investment in a given corridor.	"Reduction in emissions" meets HCT Plan (2018) Core Criteria VMT used as key performance measure in Metro 2021 TSMO Strategy	Using established transit elasticities, estimate the change in ridership that is likely occur in a given corridor by investing in HCT and the corresponding change in auto VMT that would be expected. Convert this change in VMT to GHG emissions using an average fleet emissions factor for year 2030.
Equity Benefit	Access to employment – Essential Jobs and Essential Services by Census Block within ½ mile of corridors Relative proportion of historically marginalized populations in each corridor, based on Metro's Focus Areas	TriMet and Metro Essential Destinations data. Remix Online Tool for Existing Routes Consider specific impact to in-person jobs in the region (data from TriMet <i>Forward Together</i> project)	The team will rely on data from TriMet's Forward Together program. Forward Together included location analysis of in-person jobs in the Metro region. The team will assess the relative number of in-person jobs within ½ mile of corridors using 20th percentiles. The relative proportion of historically marginalized populations within ½ mile of each corridor will be reported.
Land Use Supportiveness and Market Potential	2040 Population Density by TAZ within ½ mile of corridors 2040 Employment Density by TAZ within ½ mile of corridors Presence of higher education institutions, multi-family and affordable housing	Metro Travel Model HCT Plan (2018) Core Criteria "Land Use Supportiveness and Market Potential" Meets Section 5309 Capital Investments Grants (CIG) Small Starts Program "Land Use" and "Economic Development" criteria	Using existing 2040 Metro travel model data, the team will develop population densities within ½ mile of each corridor and rank by 20 th percentiles. The project team will also provide for purposes of comparison the average density within 1/2 mile of (1) the average existing frequent service bus line and (2) average light rail line. The same approach will be applied for total employment within ½ mile of the corridors. The presence of multi-family and affordable housing, and higher education institutions will be applied as an additional land use check.

Jurisdictional Readiness Evaluation

After screening the corridor with the quantitative criteria, the project team will conduct a “jurisdictional readiness” evaluation to provide additional context. This next evaluation will be conducted on those corridors that score highly on the quantitative evaluation. This evaluation will be qualitative and based on the following factors:

- **Documented community support**, as determined by inclusion of a given corridor in local plans, supportive language in local Comprehensive Plans, etc.
- **Political support**, as determined by an identified jurisdictional “champion” for a given corridor. HCT corridors require strong political support and usually a local agency(s) that is strongly supportive of the project and that will maintain that support over the long-term.
- **Transit-supportive local policies**, such as those encouraging multifamily housing, minimum land use densities, mixed uses, affordable housing, employment, and other areas.
- **Local anti-displacement strategies or policies**
- **Identified local funding** for implementation (either as match or as a locally-funded project).
- **Physical conditions in the corridor**, looking at the likely availability of ROW broadly within a given HCT corridor or the need for mobility solutions that could require additional ROW within a high travel and constrained corridor; known environmental constraints, and presence of sidewalks and cycling facilities. Corridors with major physical constraints would score lower relative to this criterion. However, a major influx of funding could influence the readiness of corridors with major physical constraints.
- **Assessment of work conducted to-date**, meaning, the level and amount of planning, design, environmental, or other work that has been completed to define and advance the HCT investment in a given corridor.

CORRIDOR RANKING

After both evaluation steps have been completed, the project team will conduct an initial sort of corridors into one of four tiers based on their performance. These tiers are based on the original 2009 HCT System Plan Report:

- **Tier 1 – Regional Priority Corridors:** these include corridors with an adopted Locally Preferred Alternative (LPA) under the National Environmental Policy Act (NEPA), or those where determination of the LPA is already underway (such as 82nd Avenue). These corridors are likely to score well with respect to the Federal Transit Administration’s (FTA) Capital Investment Grant (CIG) program. These corridors already have regional consensus and so were not evaluated with the Level 2/readiness criteria described above.
- **Tier 2 – Emerging Regional Priority Corridors:** Tier 2 includes corridors that score highest based on the quantitative and qualitative assessment where additional policy or planning actions may elevate the corridor to advance within the next five years. With steps taken to advance regional discussion on these corridors and/or some changes in the corridor itself, Tier 2 corridors may score well with respect to the Federal Transit Administration’s (FTA) Capital Investment Grant (CIG) program.
- **Tier 3 – Developing Corridors:** corridors that scored in the middle relative to others based on the quantitative evaluation and where the qualitative assessment shows multiple issues or needs that must be addressed, or where land use or employment and population density is marginal for HCT investment. These corridors likely require more time before advancing.
- **Tier 4 – Future Corridors:** these corridors score lowest on the quantitative and qualitative evaluation and lack policy or land use conditions that warrant near-term HCT investments.

Funding considerations will be an important “lens” applied to the initial tiering that emerges from this assessment. Available funding is fundamental to the number of corridors the region is able to advance in the

near-term and as such is an important final screen on the initial tiering. The project team will also conduct a final “policy check” to ensure the corridors that emerge from the analysis align with the HCT policy framework and the intended regional outcomes. The final funding and policy check reviews are qualitative in nature; limited modifications, additions, removals, or changes in assigned Tier may result.

Finally, the project team will describe conditions that are likely to influence future discussions on the appropriate HCT mode for each corridor. A specific mode may not be assigned to corridors, given that further study and evaluation is required to determine the appropriate mode in each corridor, as well as the final corridor routing, as part of further studies outside of this process. The team will review the following factors that contribute toward mode selection, including:

- Existing corridor ridership.
- The personal vehicle to transit travel time ratio, determined for each corridor previously (Table 1). The greater this ratio, the greater the need for corridor investment in transit priority or other interventions (e.g., stop consolidation) to improve travel times.
- Existing roadway capacity and available right-of-way: this qualitative assessment will look at the likely availability of ROW broadly within a given HCT corridor or the need for mobility solutions that could require additional ROW within a high travel and constrained corridor. This assessment aims to understand the relative difficulty of implementing HCT.

These criteria will be used to determine if they likely require <50% priority or >50% priority.

However, the project team will assign a **representative corridor and mode** for purposes of modeling corridors only to understand the high-level impacts of HCT investments on regional transit ridership and mode split. The project team will determine these representative modes based on ridership and connections to the existing HCT system. Future corridor refinement studies will make alignment and mode determinations.

AREAS SUBJECT TO FURTHER REFINEMENT

This evaluation will result in high-level information useful for confirming the vision for HCT and ranking corridors based on readiness to advance. However, identifying and tiering corridors is the first step toward advancing HCT. Detailed study and public involvement is required to advance corridors through the various phases of project development, design, construction, and implementation. An **important early step** in advancing corridors is a detailed look at alignments, potential termini, and segmentation to further define the corridor and project; it may be that only part of a corridor is ready to proceed, or that segmenting a given corridor is the preferred approach to move forward. Additional work that would occur outside of the HCT Strategy Update process and would define elements of the project further includes:

- Mode and vehicle type
- Exact alignment and termini
- Level of transit priority needed
- Station locations
- Roadway design
- Pedestrian and bicycle facilities
- Integration with the broader transportation system, including first/last mile considerations, park and rides, traffic impacts, etc.

12/8/22 Revised DRAFT Level 2 and Readiness Assessment Addendum

The following provides more details on the analysis conducted as part of the Level 2/Readiness Assessment for the HCT Strategy Update. This addendum is subject to revision as the evaluation approach and results are refined based on agency and stakeholder feedback.

Level 2 Evaluation

Metric	Approach
Transit-Auto Travel Time Ratio	<p>Results represent the estimated ratio of transit travel time to personal car travel time in a given corridor. This ratio is calculated using Google Maps travel times during the same hour for all corridors (trip departing at approximately 3:00 PM on a Wednesday), average of both directions, including transfer time (if applicable).</p> <p>Corridors were scored relative to each other based on quartiles.</p>
Productivity and Cost Effectiveness	<ul style="list-style-type: none"> • Boardings per revenue hour: calculated based on 2019 fall quarter average ridership and revenue hours on TriMet lines associated with each corridor. For those corridors where no transit line exists today, the team used the following assumptions: <ul style="list-style-type: none"> ○ Corridor 14, Central City Tunnel: productivity estimated using combined MAX Red and Blue line boardings and revenue hours. This project would affect corridor-wide travel times, and therefore the team used the corridor-wide ridership for this factor. ○ Corridor 8, Parkrose to Clark County: the team was not able to develop a ridership estimate for this route. • Capital cost per rider: this metric was estimated similarly to how it would be estimated as part of the FTA CIG program evaluation. It represents the <i>annualized federal capital cost per rider</i>. Because the HCT Strategy Update is not going to assign a specific mode to most corridors, the team developed a range of capital cost estimates based on BRT and LRT costs to feed into this metric. A low and high capital cost was generated for each corridor as follows: <ul style="list-style-type: none"> ○ Low: using the per-mile capital cost for the Division BRT project, multiplied by the representative corridor length to yield a total corridor cost. ○ High: using the per-mile capital cost for the SW Corridor LRT project, multiplied by the representative corridor length to yield a total corridor cost. <p>To align with CIG criteria, the cost was then annualized based on an average annualization factor of 30 years and 50 years for the low-end and high-end, respectively. These factors represent the average lifespan of all of the capital elements of a representative BRT and LRT project; some elements have shorter life spans (e.g., vehicles) while others have longer life spans (e.g.,</p>

Metric	Approach
	<p>trackway). Finally, the project team assumed that each corridor would receive 50% federal funding, such that effectively half of the capital cost for each corridor contributes to the federalized share. This annualized federal cost share was then divided by the number of annual riders on transit in each corridor, based on 2019 ridership data. Exceptions to the above methodology include:</p> <ul style="list-style-type: none"> ○ Corridor 14- Central City Tunnel: assumed a single capital cost based on the capital cost developed as part of Metro’s Central City Transit Capacity Analysis project (2019). ○ Corridor 18W- Montgomery Park to Hollywood: this corridor is assumed to be “streetcar.” The project team used the per-mile cost of the eastside streetcar project (from 2011), inflated using the construction cost index to 2022 dollars. ○ Corridor 6- Beaverton to Oregon City: no existing service on this line. Used the estimate of new riders that was modeled as part of the TriMet Express and Limited Stop Study (2020) for this corridor. ○ Corridors 3, 9, 10, 27 were assigned LRT as representative mode based on prior planning (2009 HCT Strategy) for purposes of scoring capital cost.
Environmental Benefit	<p>GHG reduction benefit: the methodology uses an assumed change in transit headways and research on transit elasticities to result in an estimated change in ridership based on implementing HCT, a corresponding reduction in VMT based on this increase in ridership, and in turn a reduction in GHG emissions on an annual basis in metric tons. No ridership modeling was conducted for this assessment, so the team used headway elasticities to generate a high-level estimate of change in ridership from implementing HCT in each corridor. Research shows that headway improvements are responsible for a substantial share of the ridership impact of HCT; however, the project team recognizes that this does not account for the other elements of BRT (such as improved stations, etc.) that also contribute to ridership increases. Additional assumptions for the GHG calculation are as follows:</p> <ul style="list-style-type: none"> • Used existing weekday transit ridership, average trip length, and average headways for each corridor based on 2019 TriMet data • Assumed that corridors improved to an average of 12-minute headways all day, based on Division Transit headways. • Headway elasticity is estimated at 0.5 per Victoria Transport Policy Institute (VTPI), meaning every 10% improvement in headway results in a 5% increase in ridership. For some corridors, an estimate of future ridership already exists (e.g., Central City Tunnel) and was used in place of the headway elasticity method. • The assumed increase in ridership was multiplied by the average transit trip length to generate an average increase in transit person miles travelled (PMT). • The increased transit PMT was assumed to result in a corresponding decrease in personal vehicle VMT; however, this VMT change was discounted by 50% to account for induced demand (based on research findings). When people

Metric	Approach
	<p>shift to transit from driving, some increase in driving occurs as a result of newly freed up roadway space.</p> <ul style="list-style-type: none"> The reduction in VMT was then converted to a reduction in GHG, based on the average fleet efficiency (23 miles per gallon) and average GHG content of gasoline (9 kg/gallon) in 2020 to yield an annual reduction in GHG emissions.
Equity Benefit	<ul style="list-style-type: none"> Key destinations within a ½ mile of each corridor: this metric looks at the average number of key destinations within ½ mile of each corridor. Key destinations include city halls, community centers, hospitals, libraries, and schools. The total was normalized using corridor length. Share of marginalized populations within ½ mile of each corridor: this metric uses Metro equity focus areas based on Census tracts to report the percentage of the population that are marginalized populations in each corridor. Equity focus areas are Census tracts that represent communities where the rate of Black, Indigenous, or People of Color (BIPOC), people with limited English proficiency (LEP), or people with low income (LI) is greater than the regional average. Additionally, the density (persons per acre) of one or more of these populations must be double the regional average.
Land Use Supportiveness	<ul style="list-style-type: none"> Population density: population density, per square mile, within ½ mile of each corridor based on 2040 projections from the Metro model by TAZ. Corridors with a population density above 7,000 persons per square mile are considered most supportive of HCT. Employment density: number of jobs, per square mile, within ½ mile of corridor based on 2040 projections from the Metro model by TAZ. Number of affordable housing units: number of units, per linear mile of corridor, within ½ mile of each corridor. Presence of higher education: scored based on the presence of one or more higher education institutions within ½ mile of each corridor.

Readiness Criteria

Metric	Approach
Documented Support	<ul style="list-style-type: none"> Community support: this was scored based on whether HCT or similar investment capital project is identified in local TSPs or related documents. Local champion/local funding: <i>this criterion requires further discussion and is not scored at this time.</i> Transit-Supportive Policies: this criterion looks at local jurisdiction policies that support HCT and align with the types of policies identified through the CIG program: <ul style="list-style-type: none"> Local jurisdiction anti-displacement policies Local jurisdiction policies that align with CIG funding criteria, including transit-supportive population and employment policies, housing policies, etc.

	<ul style="list-style-type: none"> • Work completed to-date: scored based on whether local jurisdictions and partners have performed work to advance a given corridor, beyond inclusion in long-range plans. This may include additional studies, projects, investments, or recent planning work supportive of advancing a given corridor. • Tolling: <i>this measure requires further discussion and is not scored at this time. The intent of this measure is to identify HCT corridors that overlap with tolling corridors.</i>
Physical Conditions in the Corridor	<ul style="list-style-type: none"> • “Physical space”: the project team determined the share of each representative corridor that is less than or equal to three lanes or greater than three lanes (four or more lanes), in addition to the share of the corridor that is railroad ROW. This criterion provides a high level understanding of how constrained a given corridor is; corridors that are predominantly along roads that are less than three lanes would likely require greater capital investments and/or ROW acquisition in order to achieve transit priority lanes or separate guideways, and in turn, may have more complex planning and design processes that require more time. Corridors that are predominantly along roads that are four or more lanes wide potentially have more opportunity to re-purpose existing roadway space for transit priority lanes/separate guideways, and in turn, may require less complex planning and design processes to advance. • Miles of sidewalks and miles of bicycle facility within ½ mile of each corridor: these metrics look at the density of the existing cycling and walking networks as a way of understanding the robustness of the first-/last-mile network in each corridor. These metrics are normalized by the length of each corridor. Corridors were scored based on whether they are higher or lower than the median across all corridors.
Implementation Complexity	<ul style="list-style-type: none"> • Length of corridor: based on TriMet experience, lengthier HCT corridors become more complex and take more time to implement. Shorter corridors were assigned a higher score. • Freight corridor: this criterion assigns a score based on whether a corridor is a designated freight corridor or not. Corridors having a freight designation are scored lower, the need maintain freight mobility can present obstacles to developing HCT.